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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

FICK, ANTHONY D

ART UNIT	PAPER NUMBER
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1753

MAIL DATE	DELIVERY MODE
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06/27/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/726,744

Applicant(s)

OLSEN ET AL.

Examiner

Anthony Fick

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 26-36 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-36 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 6/11/04 2/6/06 4/17/06
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1 through 25, drawn to a thermoelectric power source, classified in class 136, subclass 205.
 - II. Claims 26 through 36, drawn to a sputtering method to create a thermoelectric device, classified in class 204, subclass 192.25.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the thermoelectric device of group I can be made by a different process than the method of group II. The thin films can be created by other deposition methods such as physical vapor deposition or chemical vapor deposition.
3. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Lisa Caldwell on June 13, 2007 a provisional election was made without traverse to prosecute the invention of group I;

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claims 1 through 25. Affirmation of this election must be made by applicant in replying to this Office action. Claims 26 through 26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 4-6, 13-15, 17-18 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by DE 297 23 309 U1 (DE '309).

DE '309 discloses a thermoelectric power source as shown in figure 1.

Regarding claim 1, DE '309 discloses the power source comprising a flexible substrate, 1, having an upper surface and a thermoelectric couple, 4, comprising a sputter deposited thin film p-type thermoelement, 4', a sputter deposited thin film n-type

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thermoelement, 4", and an electrically conductive member, 4'", electrically connecting the ends of the thermoelements (figure 2 and page 4, paragraphs 2 to 5).

Regarding claims 4 through 6, 13 through 15, 17 and 18, the claim limitations; thermoelectric composition, power output, device volume and substrate type, are disclosed within the reference (see page 2 and page 4, paragraphs 2 to 5).

Regarding claim 23, DE '309 discloses the power source comprising a flexible substrate, 1, having an upper surface and a thermoelectric couple, 4, comprising a sputter deposited thin film p-type thermoelement, 4', a sputter deposited thin film n-type thermoelement, 4", and an electrically conductive member, 4'", electrically connecting the ends of the thermoelements (figure 2 and page 4, paragraphs 2 to 5). The thermoelectric power source having a volume of less than about 10 cm^3 and a power output from $1\text{ }\mu\text{W}$ to 1 W (page 2, paragraph 4).

8. Claims 1-5, 10 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Stark et al. (U.S.P.G.Pub 2004/0231714).

Stark discloses a thermoelectric power source as shown in figure 1.

Regarding claim 1, Stark discloses the thermoelectric device is comprised of thin film semiconductors assembled in alternating p- and n-type arrays (figure 2 and paragraph 0029). Stark discloses sputter depositing thin film p-type thermoelements, 34, sputter depositing thin film n-type thermoelements, 32, and an electrically conductive metal bridge, 26, connecting the ends of the thermoelements (figure 2 and paragraphs 0032, 0035 and 0044).

Regarding claims 2 and 3, the dimensions of Stark gives L/A ratios of greater than 100 cm^{-1} (thickness of 5 microns, width of 10 microns, length of 100 microns; see paragraphs 0032 and 0034).

Regarding claims 4 and 5, Stark discloses the use of Bi_2Te_3 (paragraph 0023).

Regarding claim 10, figure 3 shows p-type elements having different widths than the n-type elements.

Regarding claim 18, Stark discloses the use of polyimide as the substrate (paragraph 0041).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 23, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark et al. (U.S.P.G.Pub 2004/0231714).

Stark discloses a thermoelectric power source as shown in figure 1.

Regarding claim 23, Stark discloses the thermoelectric device is comprised of thin film semiconductors assembled in alternating p- and n-type arrays (figure 2 and paragraph 0029). Stark discloses sputter depositing thin film p-type thermoelements, 34, sputter depositing thin film n-type thermoelements, 32, and an electrically conductive metal bridge, 26, connecting the ends of the thermoelements (figure 2 and paragraphs 0032, 0035 and 0044).

Regarding claim 24, figure 2 shows the thermocouples connected in series.

Regarding claim 25, figure 3 shows p-type elements having different widths than the n-type elements.

The differences between Stark and the claims are the requirements of a specific volume and power output.

The choice of a specific volume for the device and a power output are dependent on the specific application for the device. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume and output power as within the claims for the device of Stark. Also Stark discloses the choice of number of thermocouples within the device is dependent on the required power for the device (paragraph 0039), thus making this choice determines the power output and the device size. Therefore the claims are obvious over Stark.

11. Claims 6 through 9, 11 and 13 through 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark as applied to claims 1-5, 10 and 18 above.

The disclosure of Stark is as stated above for claims 1-5, 10 and 18. Further, regarding claims 7 and 8, the dimensions disclosed by Stark include at least 0.1 mm in width and at least 20 angstroms in thickness (paragraphs 0032 and 0034). Also Stark discloses the use of greater than 50 or 1000 thermocouples (paragraph 0039).

The differences between Stark and the claims are the requirements of specific power outputs, electrical configurations, volume of the device and element lengths.

The choice of a specific volume for the device and a power output are dependent on the specific application for the device. The specific wiring methods, series or parallel, also affects the power/current outputs for the device and are well known within the art to alter the wiring to meet the specific requirements of an application. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume, wiring method and output power as within the claims for the device of Stark. Also Stark discloses the choice of number of thermocouples within the device is dependent on the required power for the device (paragraph 0039), thus making this choice determines the power output and the device size. The choice of element length is a further design choice that is obvious to one skilled in the art. Therefore the claims are obvious over Stark.

12. Claims 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark as applied to claims 1-5, 10 and 18 above, and further in view of Barr et al. (U.S. 4,036,665).

The disclosure of Stark is as stated above for claims 1-5, 10 and 18.

The difference between Stark and claim 12 is the requirement of a coiled substrate configuration. The difference between Stark and claim 17 is the requirement of a specific n-type element.

Barr teaches a thermopile for a thermoelectric generator. The thermopile is shown in figure 1 and comprises bismuth telluride elements sputter deposited onto a polyimide substrate (abstract). The substrate is coiled up (column 2, lines 58-61). Barr

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further teaches the use of n-type dopants such as cuprous bromide, silver iodide and antimony iodide (column 2, lines 47-49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to coil up the substrate as within Barr for the device of Stark because the coiled substrate is pencil thin, thus taking up much less space. It would have been further obvious to one of ordinary skill in the art at the time the invention was made to utilize an n-type dopant as within Barr to dope the n-type elements of Stark because Barr discloses dopants are commonly used n-type dopants in the art. Because Barr and Stark are both concerned with thin film thermoelectric devices, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.

13. Claims 19 through 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stark as applied to claims 1-5, 10 and 18 above, and further in view of Venkatasubramanian et al. (U.S.P.G.Pub 2003/0099279).

The disclosure of Stark is as stated above for claims 1-5, 10 and 18.

The difference between Stark and the claims is the requirement of specific superlattice thermoelectric material.

Venkatasubramanian teaches both p-type and n-type superlattices comprising alternating layers of Bi_2Te_3 and Sb_2Te_3 layers with thicknesses in the 50 angstrom range that have enhanced figures of merit (paragraph 0044).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the superlattice structures of Venkatasubramanian in the

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device of Stark because the superlattice structures have major enhancements in figure of merit, and electrical conduction (paragraph 0044) thus increasing the efficiency of the device of Stark. Because Venkatasubramanian and Stark are concerned with thermoelectric materials, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Fick whose telephone number is (571) 272-6393. The examiner can normally be reached on Monday - Friday 7 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Anthony Fick *ADF*
AU 1753
June 21, 2007


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